Multi-Band Vertical Antenna 160 through 10 Meters

with the patented

SAF-T-TILT™ Base

DXE-MBVE-5

US Patent Nos. D654,063 and D654,064

DXE-MBVE-5-INS-Revision 1

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Introduction

The DX Engineering **DXE-MBVE-5** is designed from the ground up to offer ease of use, reliability and performance. A fast taper multi-band vertical antenna system with the patented **SAF-T-TILT™** base (US Patent Nos. D654,063 and D654,064). The massive 3/8" thick rugged aluminum base allows easy, safe tilt action without unsafe removal of mounting hardware. The vertical antenna operates from 160 meters through 10 meters using a good quality outboard customer supplied tuner. There are no traps, coils or linear loading elements to rob power. Designed with 6063 corrosion-resistant aluminum tubing and stainless steel hardware, this antenna is very durable and attractive. The **DXE-MBVE-5** requires a special **DX Engineering UNUN** with recommended 150 feet of RG-213 coaxial cable and a customer supplied in-shack wide range tuner, or an optional **DXE-MBV-ATU-1** Automatic Tuner at the base of the antenna.

Features

- Full band coverage from 160 through 10 meters - Outboard customer supplied tuner required
- New massive **SAF-T-TILT™** Base (US Patent Nos. D654,063 and D654,064) allows safe raising and lowering of the antenna without hazardous removal of fastening hardware
- High strength thermoplastic insulator that won't crack, splinter, peel or fail
- Rugged structural grade type 6063-T832 drawn aluminum radiator - the best alloy for high strength, long lasting antenna applications
- Fast taper from rugged base to sleek top for the lowest wind resistance
- No coils or traps – Maximum radiation efficiency
- Power handling up to 5 kW - built to last
- All stainless steel hardware - very durable and attractive
- Free standing to 92 mph wind speeds

DXE-MBVE-5 Models Available

There are five different models of the DXE-MBVE-5 available:

DXE-MBVE-5	Basic antenna package with 24-/1/2" feedpoint wire for remote tuner operation
DXE-MBVE-5-4P	Antenna package with **DXE-RADP-3** Radial Plate
DXE-MBVE-5-4UP	Antenna package with **DXE-UNUN**
DXE-MBVE-5-4UPR	Antenna package with **DXE-RADP-3** Radial Plate and **DXE-UNUN**
DXE-MBVE-5-3ATP	Antenna package with **DXE-MBV-ATU-1** Remote Automatic Tuner

This manual describes in detail the **DXE-MBVE-5-4UPR** antenna package which includes the basic antenna with the **DXE-RADP-3** Radial Plate and **DXE-UNUN**.

Appendix 2 shows the **DXE-MBVE-5-3ATP** Antenna with the **DXE-MBV-ATU-1** Remote Automatic Tuner installed.

WARNING!

INSTALLATION OF ANY ANTENNA NEAR POWER LINES IS DANGEROUS

Warning: Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, because they may cause serious injury or death.

Overhead Power Line Safety

Before you begin working, check carefully for overhead power lines in the area you will be working. Don't assume that wires are telephone or cable lines: check with your electric utility for advice. Although overhead power lines may appear to be insulated, often these coverings are intended only to protect metal wires from weather conditions and may not protect you from electric shock. Keep your distance! Remember the 10-foot rule: When carrying and using ladders and other long tools, keep them at least 10 feet away from all overhead lines - including any lines from the power pole to your home.

Tools Required

Two 7/16 wrenches, (one of them should be open-end)
5/16, 3/8, 9/16, and 3/4 inch wrenches or
5/16, 3/8, 9/16, and 3/4 inch sockets and drive
Medium size flat blade screwdriver or 5/16 nut driver for the element clamps
Medium size flat blade screwdriver or 1/4 nut driver for the smaller element clamps
Tape measure
Felt-tip marker

Manual Updates

Every effort is made to supply the latest manual revision with each product. Occasionally a manual will be updated between the time your DX Engineering product is shipped and when you receive it. Please check the DX Engineering web site (www.dxengineering.com) for the latest revision manual.

Suggested Parts Not Included

DXE-RADW Radial Wire Kits and Components
There are optional DX Engineering Radial Wire Kits available. **DXE-RADW-500K/BD** contains a 500 foot spool of 14 gauge copper stranded wire with black relaxed PVC insulation, 20 Terminal Lugs and 100 Steel or Biodegradable Lawn Staples. The **DXE-RADW-1000K/BD** Radial Wire Kit contains a 1,000 foot spool of 14 gauge copper stranded wire with black relaxed PVC insulation, 40 Terminal Lugs and 200 Steel or Biodegradable Lawn Staples. **RADW-20RT, -32RT** or **-65RT** contain 20 each radial wires with 1/4" terminal attached. These kits come in 20 Ft, 32 Ft, or 65Ft lengths.

DXE-GUY-200 Guying Kit for Vertical Antennas
Some vertical antenna manufacturers indicate their antennas do not need guying. During times of high winds or ice loading, some of these vertical antennas may sustain damage or fail altogether. With the small amount of effort needed to install a four point guying system, the risk hardly seems worth taking. A four-point guying scheme provides the best mechanical advantage to reduce wind stress, regardless of direction. A four point guying system is recommended for use with the DX Engineering **SAF-T-TILT™** Base, because just one of the guy ropes has to be loosened when you tilt the vertical antenna down. The remaining guys help stabilize the vertical antenna in three directions when being raised. For details on guying this antenna, refer to the **Guying a Vertical Antenna System** page.

See these and other options available from DX Engineering for this antenna system in this manual refer to the **Optional Accessory Items** page.

Additional Material Needed but not Supplied:

- **Antenna Mounting** - Steel mounting pipe, up to 2.0″ OD, 0.25″ wall thickness, 4 feet long. The standard 1-1/2" galvanized water pipe (with its 1.9" OD) is just fine for this application and can usually be found at your local home building supply store.

- **Quik-Set or other type of Concrete** - Mounting pipe installation (type depends on your particular conditions and landscape)

- **DXE-P8A - Penetrox** - To ensure good connection for aluminum element sections

- **UMI-81343 Never-Seez** or **DXE-NSBT8 Anti-Seize** compound - used on the threads of Stainless Steel Hardware to prevent galling (seizing) and aid in proper tightening.

Installation

This manual describes in detail the **DXE-MBVE-5-4UPR** antenna package which includes the **DXE-MBVE-5** antenna with the **DXE-RADP-3** Radial Plate and **DXE-UNUN**.

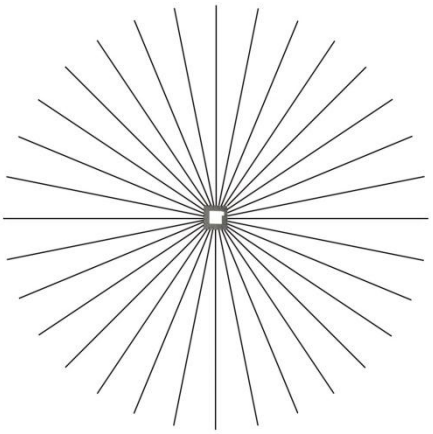
Site Selection

Select a mounting location clear from power lines, structures and other antennas by a minimum of 55 feet. **Consider overhead power lines, utility cables and wires**. The vertical should mounted away from local noise sources or other metallic objects which can re-radiate noise and affect the tuning, radiation pattern and SWR. Determine the direction you want the antenna to tilt down and make sure there is adequate clearance (at least 55 feet). There should also be a clear diameter of 70 feet from the antenna for the guying and radial systems that will extend away from the antenna.

Radial System

The use of a radial system is a key requirement for any high performance quarter wave vertical antenna system. With a vertical antenna system, the radials are the second half of the antenna. The radials contribute to the radiation efficiency of the entire vertical antenna system.

At a minimum, 20 radials, each 32 feet long, should be used with this antenna. Using 32 radials at 65 feet long is preferred and highly recommended. The extra radials help overcome unknown poor-soil conditions, improve bandwidth, and ensure the best performance possible from the vertical antenna. **DXE-RADW** Radial Wire, a 14 gauge stranded copper with a black relaxed PVC insulation wire is suggested for the best results.

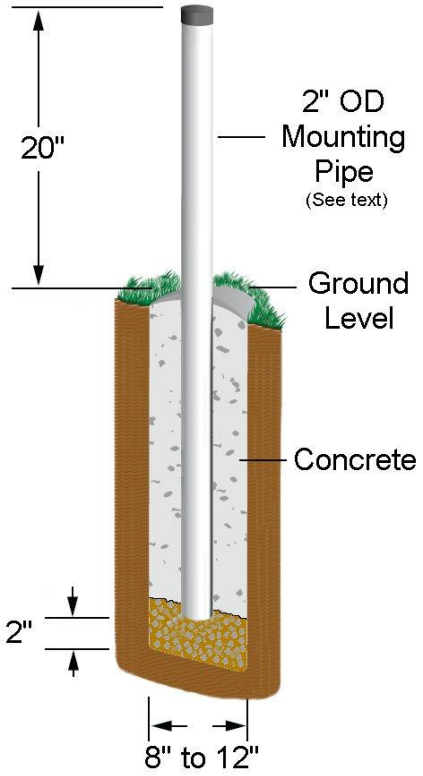


The wire radials should placed as symmetrically as possible straight from the feedpoint around the vertical antenna and spaced evenly, regardless of how many radials are used. Do not cross or bunch any radial wires as this nullifies their effectiveness. If you have limited space, put in as many straight radials as you can. The radials must be connected to the shield of your feedline. The **DXE-RADP-3** Stainless Steel Radial Plate is the ideal optional item which provides an excellent system for attaching radial wires to your vertical antenna system.

Radial wires can be laid on the roots of the grass using **DXE-STPL** Radial Wire Anchor Pins to hold them down. Using enough staples will ensure the wires will not be snagged by mowers, people, or animals. Grass will quickly overgrow the radials and it will be virtually impossible to see them. An article describing this process is available on the DX Engineering website in the **Tech Info** section. Radials can also be buried just under the surface by using a power edger to make a slit in the soil.

Mounting Pipe

Use a customer supplied thick-walled galvanized steel mounting pipe *at least* 4 feet long. This will allow approximately 2 feet or more to be below ground and 20 inches above ground. A thick-walled steel pipe 1-3/4" OD to 2" OD *maximum* is recommended with a minimum thickness of 1/8" (1/4" preferred) should be used. **The standard 1-1/2" galvanized water pipe (with its 1.9" OD) is just fine for this application and can usually be found at your local home building supply store.** For permanent mounting, use a post-hole digger to make a hole deep enough to accommodate at least 2 feet of pipe and a couple inches of gravel at the bottom for drainage. Set the mounting pipe on the gravel, use the pre-mix concrete to fill around the pipe, adding water and mixing as you fill or mix the concrete first, then pour in the hole (depends on the type of concrete you purchase). Fill the hole until the concrete is level with the ground around it. Use a level on the mounting pipe as you fill the hole to be sure it is vertically straight. Allow to set overnight or per the concrete manufacturer's recommendations. Your location, landscape and ground conditions may require different mounting solutions in order to have the steel mounting pipe and the vertical antenna in a secure position.



Note: Galvanized steel, rather than aluminum, is much more suitable for mounting in concrete. Aluminum will quickly corrode due to incompatibility with the materials used to make concrete.

Assembly

Carefully un-box the antenna and separate the various parts. All of the element sections are 36" long. The 2-1/8" OD antenna element is slit on one end and drilled on the other end. All the other sections are slit on one end except for the top 3/8" OD element.

Note: ***DXE-P8A Penetrox A Anti-Oxidant*** *should be used between all antenna element sections. Penetrox is an electrical joint compound to affect a substantial electrical connection between metal parts such as telescoping aluminum tubing or other antenna pieces. It ensures high conductivity at all voltage levels by displacing moisture and preventing corrosion or oxidation.*

Note: ***UMI-81343 Never-Seez*** *or* ***DXE-NSBT8 Anti-Seize*** *should be used on all clamps, bolts and stainless steel threaded hardware to prevent galling (seizure) and to ensure proper tightening.*

Note: The following assembly instructions are based on the MBVE-5-4UPR which includes the DXE-RADP-3 Radial Plate and the MBVE-5 DXE-UN-43 UNUN with hardware and mounting bracket using a customer supplied 2" OD Mounting Pipe.

Note: For reference purposes, an exploded drawing of the completed **SAF-T-TILT™** base is show in **Appendix 1**, **Figure A-1**.

Radial Plate to Mounting Pipe

Install the patented **DXE-RADP-3** Radial Plate on the 2" OD customer supplied mounting pipe using the **DXE-SSVC-2P** V-Bolt Saddle Clamp as shown in **Figure 1**. The standard 1-1/2" galvanized water pipe (with its 1.9" OD) is just fine for this application and can usually be found at your local home building supply store. Mount the Radial Plate so you have approximately 1" of space between the bottom of the plate and the ground level. This will allow easy access to install the radial wire hardware. The **DXE-RADP-3** Radial Plate comes with 20 sets of stainless steel hardware for mounting the radial wires. Additional hardware kits are available from DX Engineering: **DXE-RADP-1HWK** contains 20 sets of Radial Plate Hardware. Check which direction you want the antenna to tilt. Mount the radial plate as shown in relation to the **SAF-T-TILT™** Tilt Base. For reference, **Figure 19** shows a completed installation.

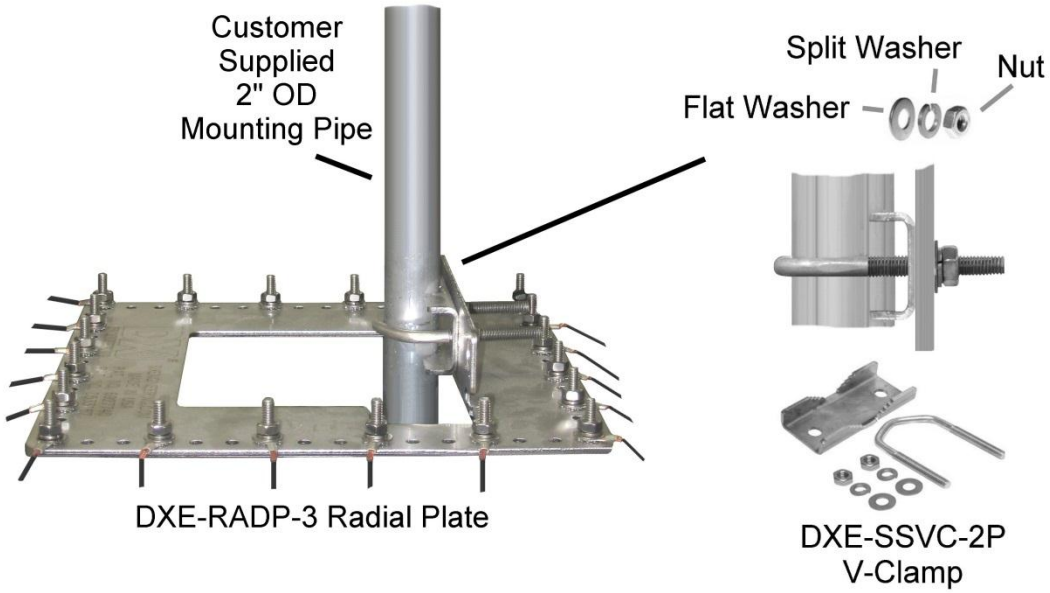


Figure 1 - DXE-RADP-3 Radial Plate Installation on customer supplied mounting pipe (shown with part of the radial wires attached)

Attaching the optional Ground Radial Wires to the Radial Plate

Using the 20 sets of supplied 1/4" stainless steel hardware (Bolt, Star Washer, Flat Washer, Split Washer, Nut) connect the optional ground radial wires to the **DXE-RADP-3** Radial Plate as shown in **Figure 2**. Additional hardware kits are available from DX Engineering: **DXE-RADP-1HWK** contains 20 sets of Radial Plate Hardware.

There are optional DX Engineering Radial Wire Kits available. **DXE-RADW-500K/BD** contains a 500 foot spool of 14 gauge copper stranded wire with relaxed black PVC insulation, 20 Terminal Lugs and 100 Steel or Biodegradable Lawn Staples. The **DXE-RADW-1000K/BD** Radial Wire Kit contains a 1,000 foot spool of 14 gauge copper stranded wire with relaxed black PVC insulation, 40 Terminal Lugs and 200 Steel or Biodegradable Lawn Staples. **RADW-20RT, -32RT** or **-65RT** contain 20 each radial wires with 1/4" terminal attached. These kits come in 20 Ft, 32 Ft, or 65Ft lengths. See these and other options available listed in this manual starting on page 28.

Depending on the number of radial wires used, space them out evenly around the Radial Plate like the spokes on a wheel. The Radial Plate will accommodate up to 60 radial wires (60 laser drilled holes), or up to 120 radials if doubled up.

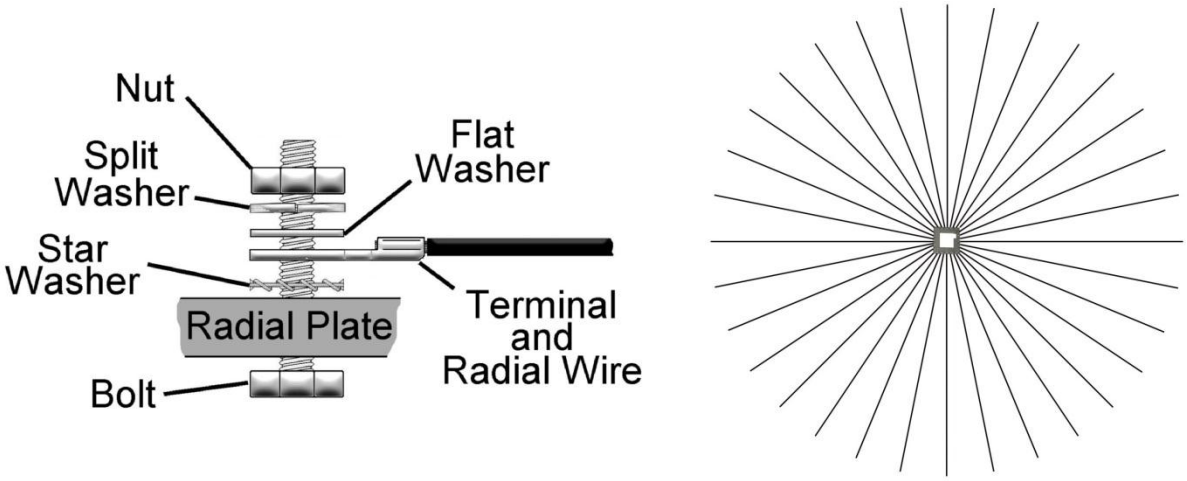


Figure 2 - Radial Wire Hardware Installation

Tilt Base to Mounting Pipe

Install the **SAF-T-TILT™** Tilt Base to the 2" OD mounting pipe using the two 3/8" SSVC V-Bolt Saddle Clamps allowing approximately 3-1/2" clearance between the bottom of the tilt base plate, to the top of the **DXE-RADP-3** Radial Plate as shown in **Figure 3**. The standard 1-1/2" galvanized water pipe (with its 1.9" OD) is just fine for this application and can usually be found at your local home building supply store.

Make sure the Tilt Base and **DXE-RADP-3** Radial Plate are oriented correctly for the direction you wish to tilt the antenna. See **Figure 11** which shows the tilt action.

Tighten the v-clamps evenly so the length of the exposed threads is approximately equal. Any clamp should be tightened evenly from side-to-side with an equal amount of thread above each nut. Once tight, place a Black Vinyl Cap on the ends of the V-Clamps as shown in **Figure 3**.

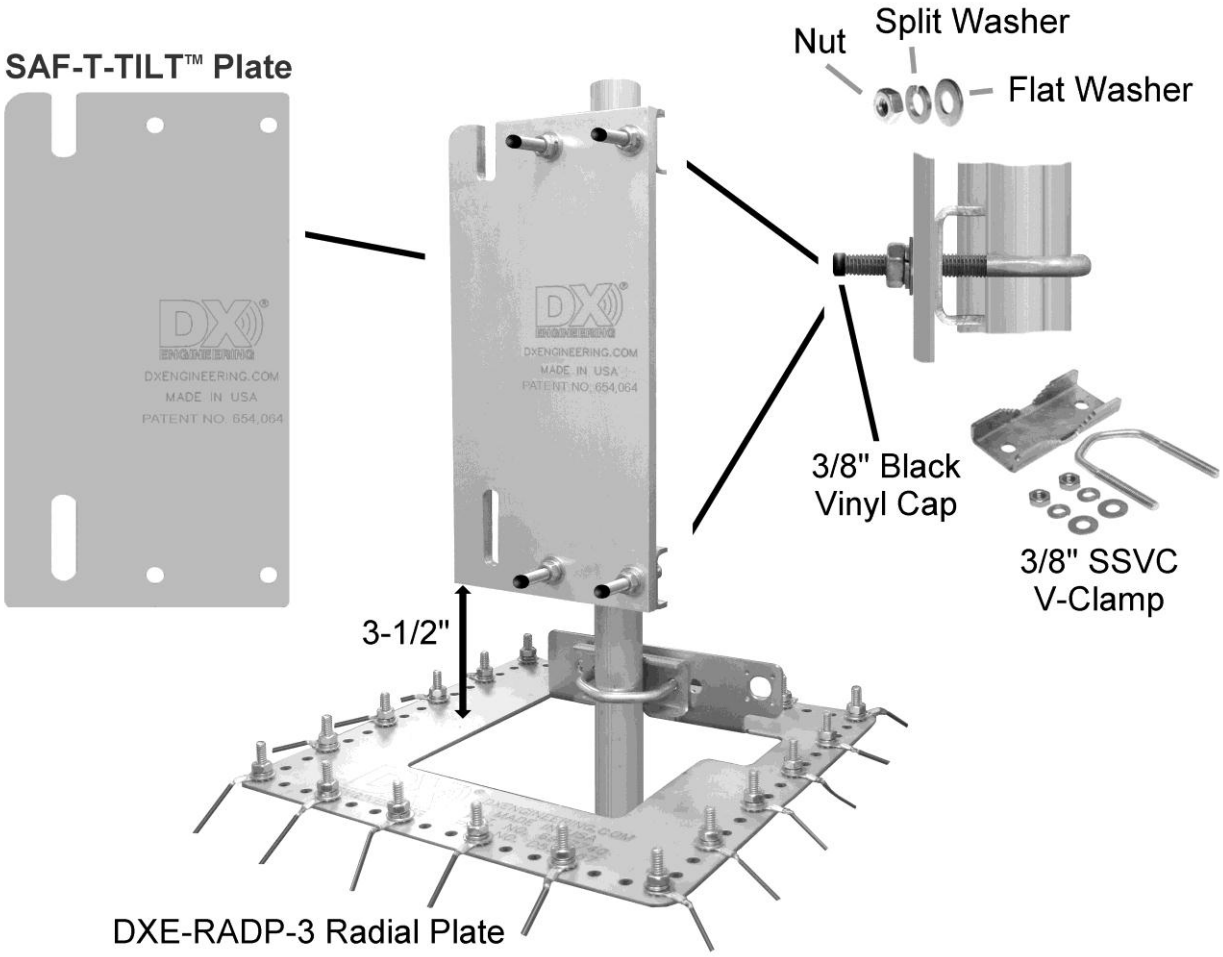


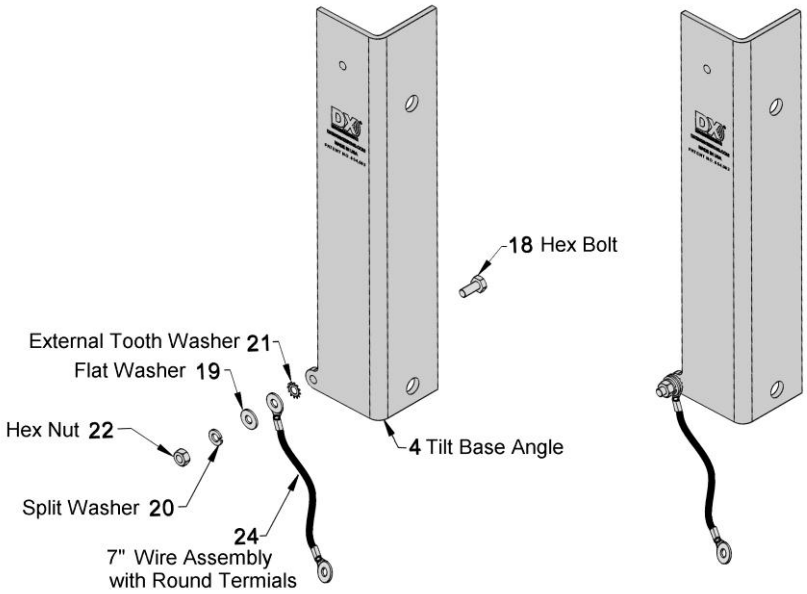
Figure 3

NOTE: If you are installing the optional **DXE-MBV-ATU-1** Multi-Band Vertical Remote Antenna Tuner Add-on Kit please refer to **Appendix 2** for details.

Antenna Base Section Assembly

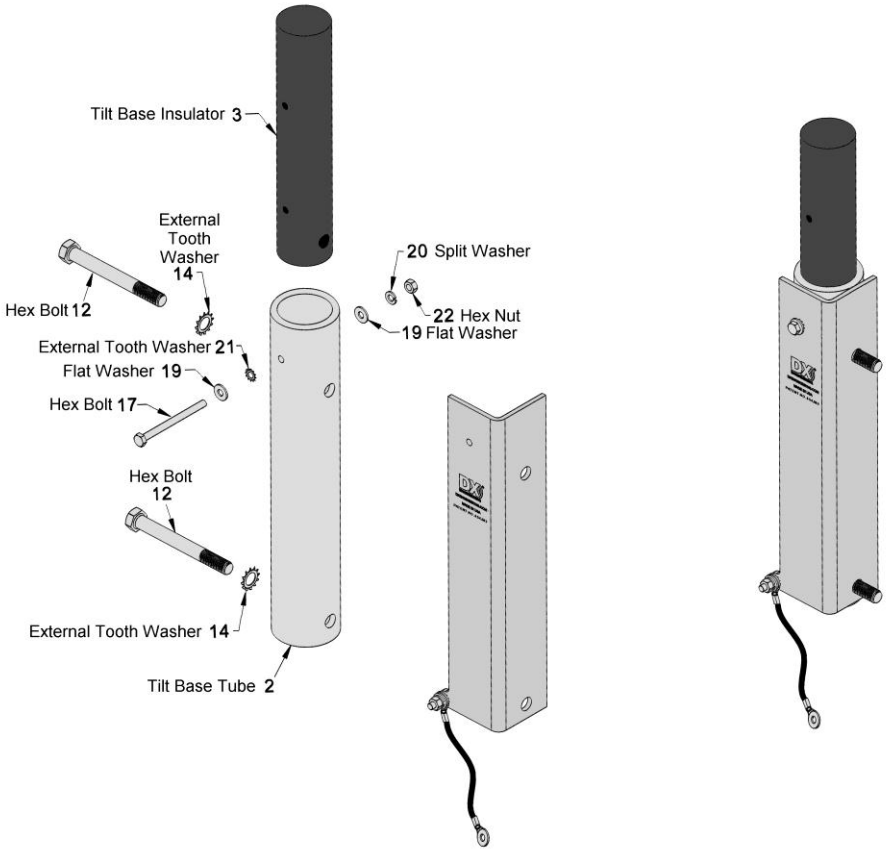
Attach the 7” ground wire with ring terminals to the tilt base angle plate using the hardware as shown in **Figure 4**. Refer to **Appendix 1** for description of numbered parts.

Figure 4



Attach the tilt base tube to the tilt base angle using the hardware as shown in **Figure 5**.

Figure 5



Attach the completed assembly to the tilt plate using the hardware as shown in **Figure 6**.

Figure 6

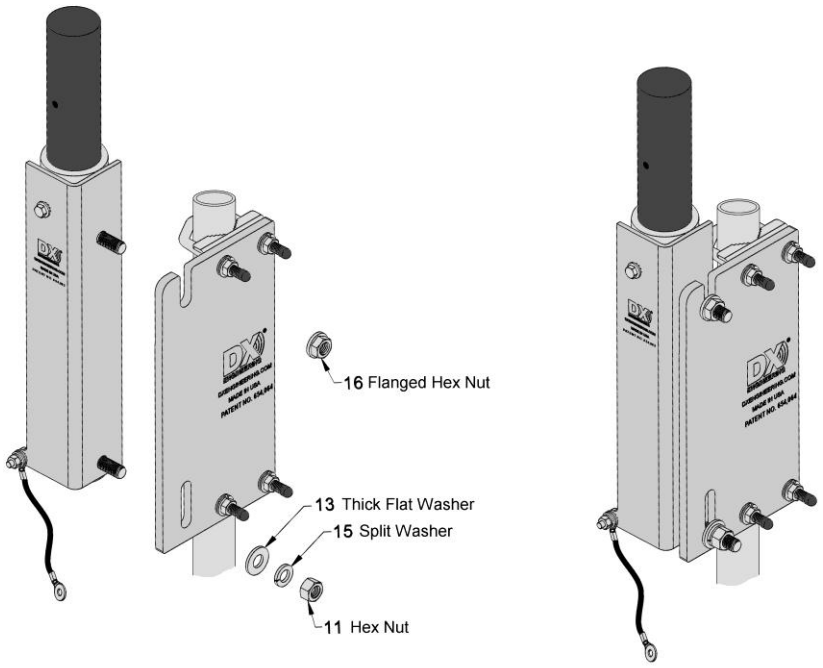
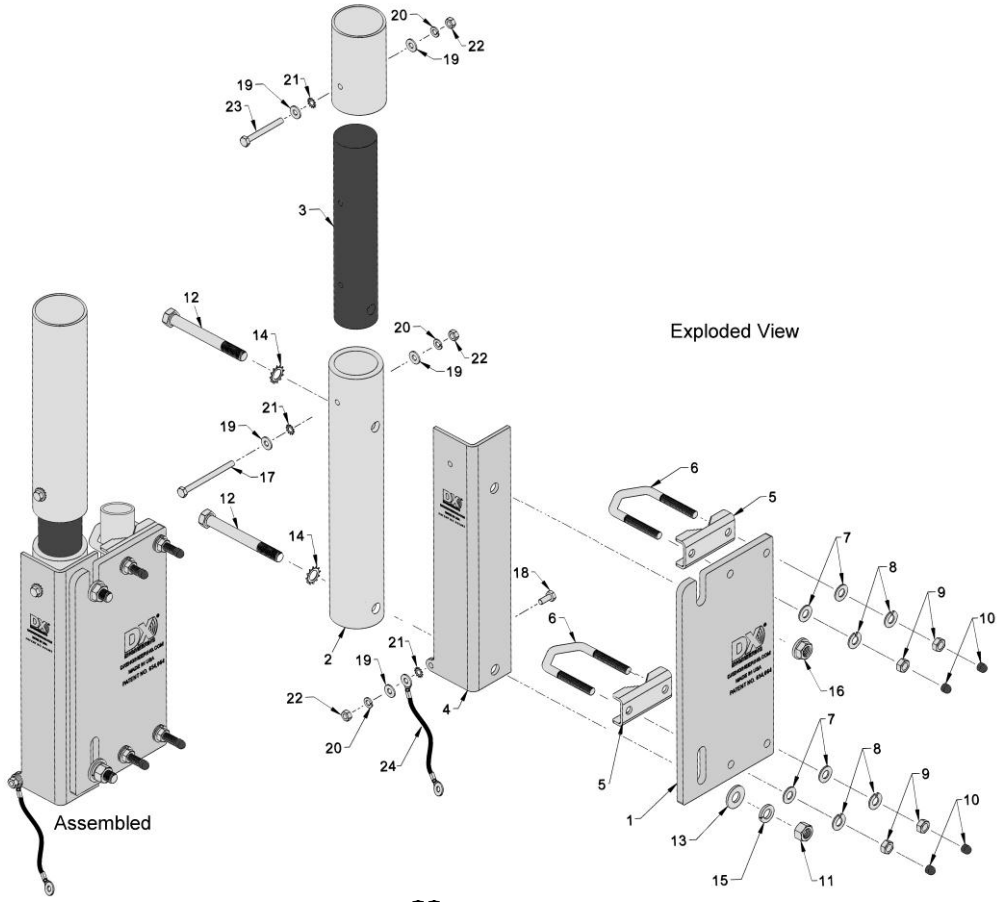


Figure 7 is shows all of the parts for reference purposes. Pictures are shown in **Figure 19** and **Appendix 1** has a full description of numbered parts.

Figure 7



Aluminum Tubing Information

When assembling any telescoping aluminum tubing sections you should take the following steps:

1. Make sure the edges are smooth and not sharp. Deburring may be necessary, since burrs and shavings can occur on seams as well as edges. All surfaces need to be completely smooth to allow easy assembly of tubing sections.

   Caution
   Aluminum tubing edges can be very sharp.
   Take precautions to ensure you do not get accidentally cut.

   The raised particles and shavings that appear when the aluminum tubing is machined are referred to as burrs, and the process by which they are removed is known as deburring.

   Deburring is a finishing method used in manufacturing. Our aluminum tubing is machine cut on both ends and machine slit on one end. Although DX Engineering manufactured aluminum tubing is deburred, you should further assure that there are no ragged edges or protrusions.

   Use the **DXE-22166 Slim Grip Deburring Tool**, or the **DXE-22600 Deburring Tool with Extending Handle and Extra Blades** for this operation.

2. Clean the inside of the aluminum tubing to clear out any dirt or foreign material that would cause the aluminum tubing sections to bind during assembly. Do not use any type of oil or general lubricant between the aluminum tubing sections. Oils or general lubricants can cause poor electrical connections for radio frequencies.

3. Clean the outside of the aluminum tubing to clear any dirt or foreign material that would cause the clamps to malfunction during assembly.

4. The use of **DXE-P8A Penetrox A** is highly recommended. Penetrox A is an electrical joint compound which effects a substantial electrical connection between metal parts such as telescoping aluminum tubing or other antenna pieces. Using Penetrox A assures high conductivity at all voltage levels by displacing moisture and preventing corrosion or oxidation.

5. When assembling the aluminum tubing sections, ensure the area is clear of grass, dirt or other foreign material that could cause problems during assembly of the closely fitted telescoping sections.

Assembling the Vertical Sections

> ***Note:*** ***DXE-P8A -Penetrox A Anti-Oxidant*** *should be used between all antenna element sections. Penetrox is an electrical joint compound to affect a substantial electrical connection between metal parts such as telescoping aluminum tubing or other antenna pieces. It ensures high conductivity at all voltage levels by displacing moisture and preventing corrosion or oxidation*

Assemble the vertical sections in an area that is flat and has sufficient room for the length of the antenna during assembly. Lay the tubing out in descending OD sizes. Orient the slits in the tubes toward the top of the antenna. The bottom 2.125" (2-1/8") OD base section has slits on one end and the feedpoint connection hole at the bottom end. All the sections are 36" long.

Each tubing section is inserted 4" into the next larger tube. Assembly is easier if the overlaps in the tubing sections are pre-marked. A dark color felt-tip marker works well. Measure and mark 4" from the end of each tube without the slit using a marker so it will be clearly visible.

Locate the 14 Element Clamps.

Element Clamp	Quantity
DXE-ECL-020 - Element Clamp	1
DXE-ECL-040 - Element Clamp	1
DXE-ECL-060 - Element Clamp	2
DXE-ECL-10SS - Element Clamp	2
DXE-ECL-12SS - Element Clamp	1
DXE-ECL-16SS - Element Clamp	2
DXE-ECL-20SS - Element Clamp	2
DXE-ECL-24SS - Element Clamp	2
DXE-ECL-28SS - Element Clamp	1

Refer to **Figure 10** for element clamp sizes and locations. Slide the clamps over each section before putting them together. Align the clamps on each section facing the same direction. For final assembly, all the clamps should be positioned very close to the top of each section and the body of the clamp should be positioned between the slits as shown in **Figure 8**.

Figure 8

Vertical Antenna Elements	Qty
2.125" (2-1/8”) x 0.058" x 36" Tube (Slit one end, drilled)	1
2.000" (2”) x 0.058" x 36" Tube (Slit one end)	1
1.875" (1-7/8”) x 0.058" x 36" Tube (Slit one end)	1
1.750" (1-3/4”) x 0.058" x 36" Tube (Slit one end)	1
1.625" (1-5/8”) x 0.058" x 36" Tube (Slit one end)	1
1.500" (1-1/2”) x 0.058" x 36" Tube (Slit one end)	1
1.375" (1-3/8”) x 0.058" x 36" Tube (Slit one end)	1
1.250" (1-1/4”) x 0.058" x 36" Tube (Slit one end)	1
1.125" (1-1/8”) x 0.058" x 36" Tube (Slit one end)	1
1.000" (1”) x 0.058" x 36" Tube (Slit one end)	1
0.875" (7/8”) x 0.058" x 36" Tube (Slit one end)	1
0.750" (3/4”) x 0.058" x 36" Tube (Slit one end)	1
0.625" (5/8”) x 0.058" x 36" Tube (Slit one end)	1
0.500" (1/2”) x 0.058" x 36" Tube (Slit one end)	1
0.375" (3/8”) x 0.058" x 36" Tube (no slits)	1

Making sure dirt or grass does not adhere to the sections to be joined, insert the marked end of an element tube into the next sized element tube until the 4 inch mark on the element tube is even with the top of the larger element tube section. Position one of the element clamps at the very end, but not hanging over the edge. Make sure the body of the element clamp is positioned between the slits and tighten securely. Repeat the procedure with the marked end of the elements and the other element tubes using one of the element clamps as you work your way up the antenna length. Continue mating the smaller tubes inside the larger ones. Double-check the vertical sections you have just assembled.

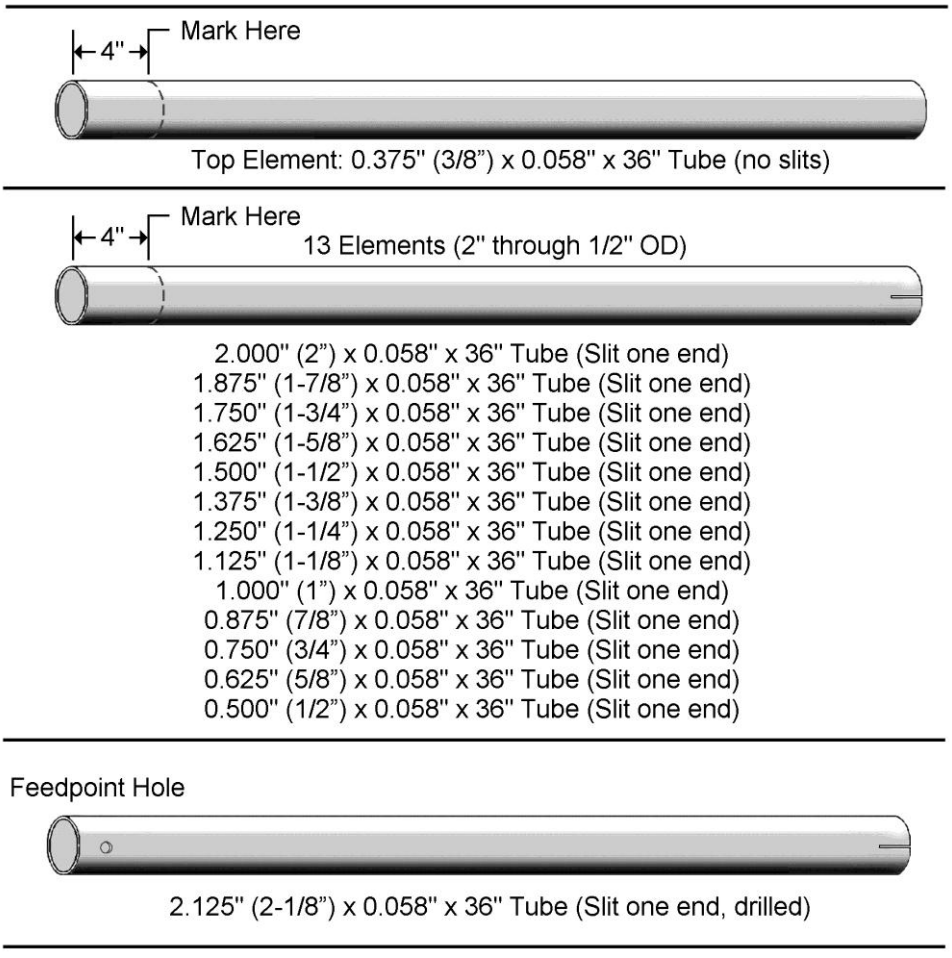
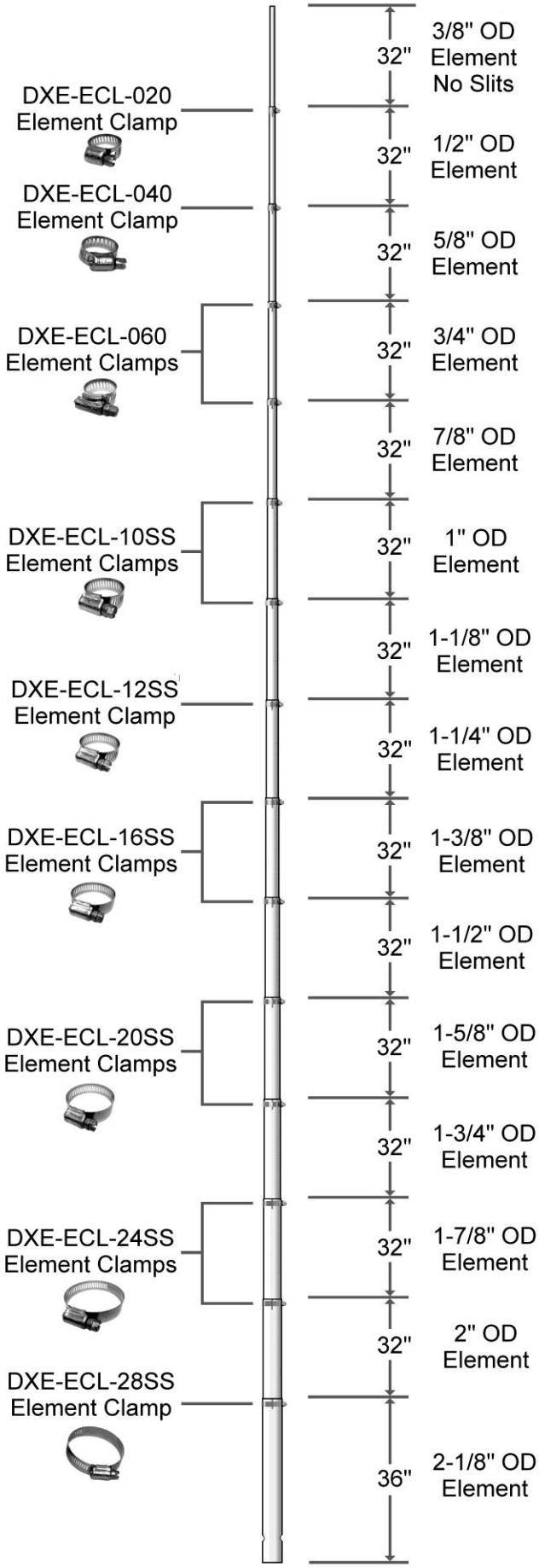

4"
Mark Here
Top Element: 0.375" (3/8”) x 0.058" x 36" Tube (no slits)
4"
Mark Here
13 Elements (2" through 1/2" OD)
2.000" (2”) x 0.058" x 36" Tube (Slit one end)
1.875" (1-7/8”) x 0.058" x 36" Tube (Slit one end)
1.750" (1-3/4”) x 0.058" x 36" Tube (Slit one end)
1.625" (1-5/8”) x 0.058" x 36" Tube (Slit one end)
1.500" (1-1/2”) x 0.058" x 36" Tube (Slit one end)
1.375" (1-3/8”) x 0.058" x 36" Tube (Slit one end)
1.250" (1-1/4”) x 0.058" x 36" Tube (Slit one end)
1.125" (1-1/8”) x 0.058" x 36" Tube (Slit one end)
1.000" (1”) x 0.058" x 36" Tube (Slit one end)
0.875" (7/8”) x 0.058" x 36" Tube (Slit one end)
0.750" (3/4”) x 0.058" x 36" Tube (Slit one end)
0.625" (5/8”) x 0.058" x 36" Tube (Slit one end)
0.500" (1/2”) x 0.058" x 36" Tube (Slit one end)
Feedpoint Hole
2.125" (2-1/8”) x 0.058" x 36" Tube (Slit one end, drilled)

Figure 9



(Drawing not scale)

Figure 10
Element Assembly

Mating the Vertical Sections to the SAF-T-TILT™ Base

Note: ***Sawhorses or ladders should be used to support the vertical sections during assembly with the SAF-T-TILT™ Base and whenever the vertical is tilted down. As shown in Figure 12.***

When the upper element sections are assembled together install the black vinyl cap in place at the top of the smallest element section.

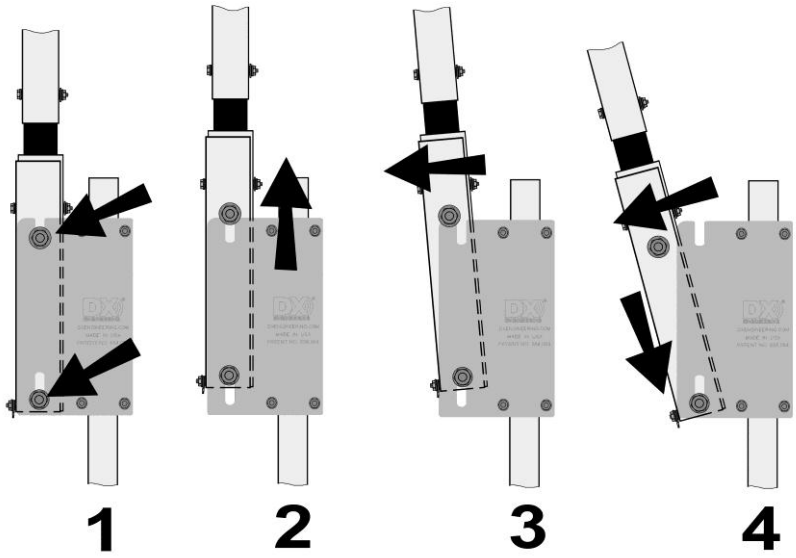


Figure 11 - SAF-T-TILT™ Tilt Action

1. Loosen the two large bolts just enough to allow movement. 1/2 turn or so should be sufficient.
2. Raise the base section up to move the upper bolt out of the safety channel.
3. Slightly tilt until the bolt slides off of the tilt base, which will;
4. Allow the bottom bolt to slide to the bottom of the lower safety channel. You can then lower the antenna as needed. Remember to support the antenna when tilted down. Do not allow the antenna to rest on the ground without support. Doing so may bend the vertical antenna elements. The antenna will normally bend when raising or lowering, but this temporary bending will not be permanent.

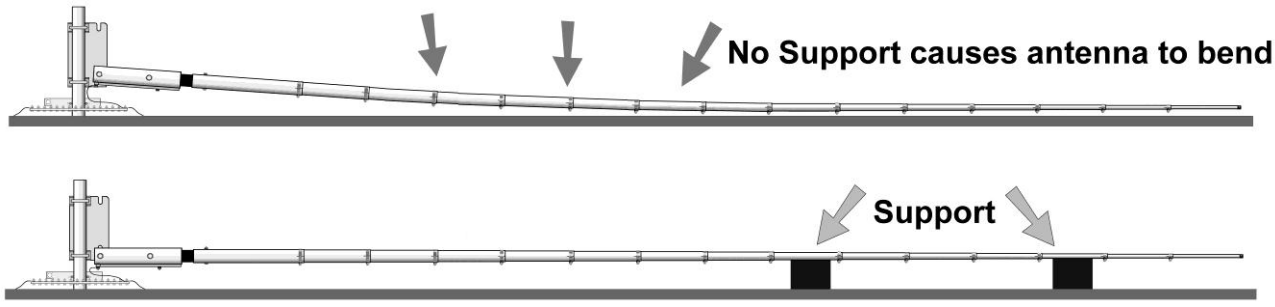


Figure 12 - Supporting a lowered antenna

While holding the base at approximately a 90 degree angle, slide the bottom 2-1/8” OD element section onto the black insulator, aligning up the two holes in the 2” OD aluminum tube with the two holes in the black insulator as shown in **Figure 13**.

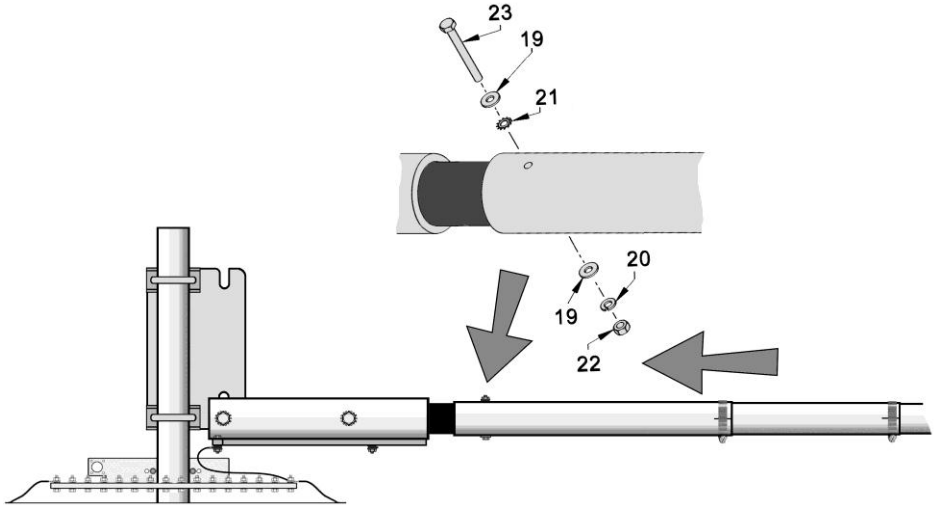


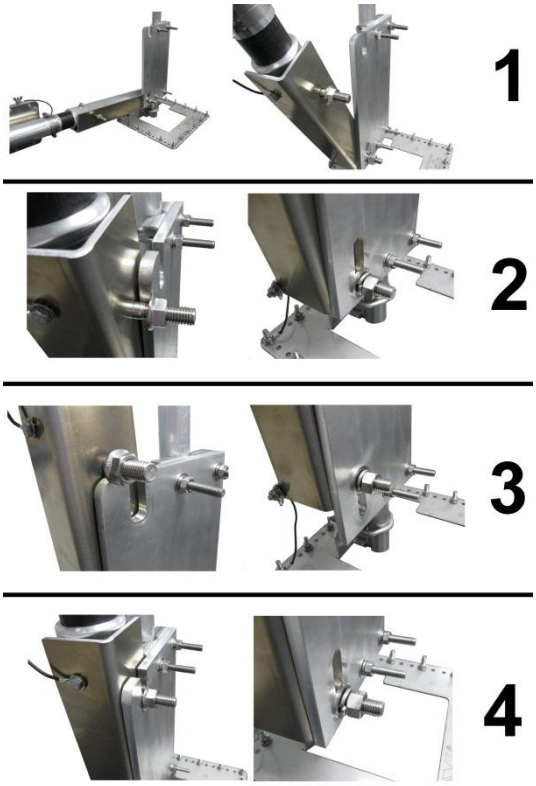
Figure 13 - Mating the vertical antenna to the SAF-T-TILT™ Base assembly

Once the holes are aligned, install the 1/2-20 x 2-3/4” long stainless steel hex bolt with the flat washers, external tooth washer, split washer and nut as shown in **Figure 13**.

Raising the Vertical

DANGER: Make sure you have not inadvertently located the antenna underneath power lines.
Residential power lines are often less than 40' high.
Contact With Any Power or Utility Lines Can Be Lethal !

The tilt-base certainly makes it easier however, this antenna can be challenging to put up the first time or with gusty winds. If you have properly laid out your optional guy system in advance, it will help keep the vertical stable as you raise it – and stop you from going beyond vertical at the apex of the lift. See the **Guying a Vertical Antenna System** section of this manual for guy rope details. Make sure the optional guy ropes are in the clear before you begin. Under optimum conditions, this is usually a one-person operation.



1 Starting from mid way up the antenna, walk it up slowly using an overhead hand-over-hand motion, maintaining a slow and steady pace.

2 Once you get the antenna near the **SAF-T-TILT™** base,

3 lift and slide to the right (as shown) until the top bolt will,

4 drop into the **SAF-T-TILT™** base slot. Once in place, tighten the upper and lower bolts to secure the antenna in place.

Figure 14 - Raising the SAF-T-TILT™ Base

The antenna mounting channel must be kept in parallel alignment with the tilt-base plate to prevent binding until it is positioned in the tilt-base. Once the antenna is vertical, lift and slide the antenna to the right (as shown above) toward the tilt-base mounting pipe to allow top bolt to line up and drop down into the **SAF-T-BASE™** slot. Once the antenna is fully raised, tighten the tilt base hardware.

When lowering the antenna, it is only necessary to loosen the upper and lower nuts 1/2 turn or so, eliminating the chance of dropping and loosing loose hardware on the ground, or trying to reach it when dropped beyond an arm-length away - un unsafe situation.

Assembling the UNUN Mounting Bracket

Using the #6 hex head bolts, #6 flat washers, and #6 Nyloc nuts, attach the UNUN to the patented UNUN Bracket with the SO-239 connector facing as shown below. Tighten the Nyloc Nuts so they are snug. Do not over tighten since the mounting tabs on the UNUN are plastic.

Attach the stainless steel studded element clamps to the UNUN Bracket using the Aluminum Spacers and #10 Nyloc nuts as shown in **Figure 15**. Snug the #10 Nyloc nuts just to the point that you can still rotate the custom studded element clamps. The Nyloc nuts will be tightened later.

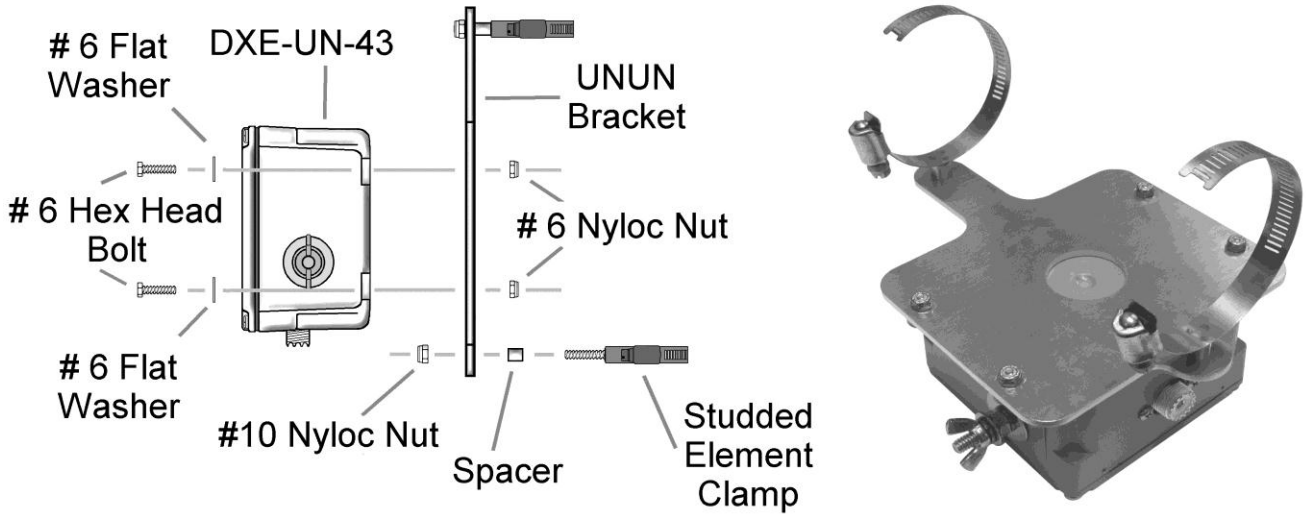


Figure 15

NOTE: If you are installing the optional **DXE-MBV-ATU-1** Multi-Band Vertical Remote Antenna Tuner Add-on Kit for 43 Foot Multi-band Vertical Antennas, you do not need to install the UNUN. Please refer to **Appendix 2** the **DXE-MBV-ATU-1** section of this manual for details.

Installation of UNUN Assembly to Antenna Lower Section

The completed UNUN and UNUN Mounting Bracket assembly are mounted to the antenna lower section. To allow easy installation of the UNUN Bracket to the lower base section, open the upper and lower custom studded element clamps as shown in **Figure 16**.

Figure 16

Position the UNUN and mounting bracket so the bottom element clamp is located between the feedpoint hardware and the black insulator shown in **Figure 17**. Tighten the element clamps to hold the assembly in place. Also tighten the Nyloc nuts that hold the studded element clamps to the UNUN bracket.

Figure 17

Clamps open, Clamp Ends inserted to go around the antenna element
Tighten in place with UNUN facing outward

Feedline Connections

The **DXE-UN-43** UNUN is attached to the feedline antenna connection using one 6" wire with ring terminals and one 7" wire with ring terminals. Connect the 6" wire with terminals from the antenna feedpoint located on the antenna element to the terminal on the **DXE-UN-43** UNUN closest to the **Red "+"** on the label as shown in **Figure 18**. Do not over tighten the wing nuts. Hand tighten them only, do not use pliers or other tools to over tighten the wing nuts.

Connect the other 7" wire with ring terminals from the terminal on the **DXE-UN-43** UNUN closest to the **Black "—"** on the label to the bolt on the angle plate as shown in **Figure 18**.

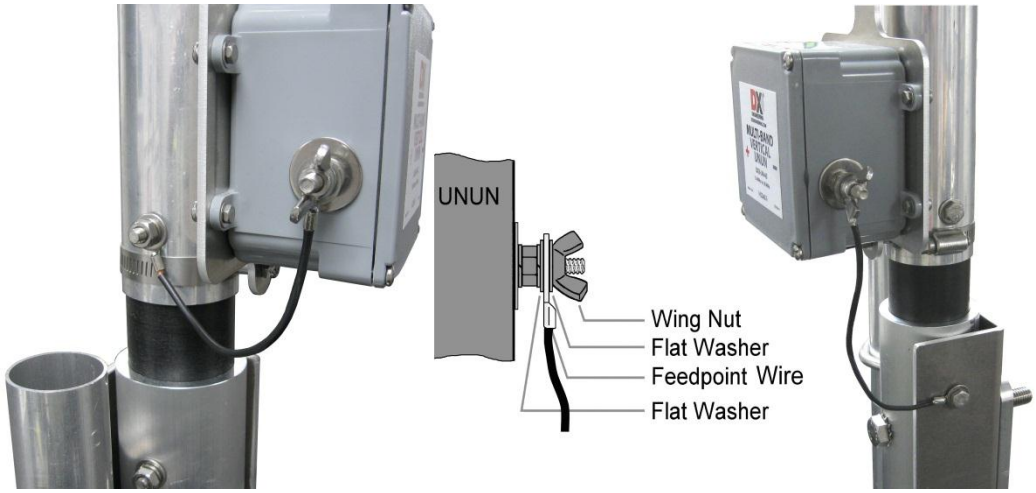


Figure 18

Your coaxial cable from the radio connects direct to the SO-239 connector on the **DXE-UN-43** UNUN. Weatherproof this coaxial connection using **DXE-33PLUS** - Scotch® Super 33+ and **DXE-3M2155** - 3M Temflex™ 2155 Rubber Splicing Tape.

Tuning the Vertical Antenna System

The use of a customer supplied, high quality, outboard tuner is required for any multi-band trapless vertical antenna system. The tuner should be capable of tuning the wide range of impedances presented by the antenna and coaxial cable at all the operating frequencies. Tuners of this type generally have a good quality variable roller inductor and at least one large variable capacitor for fine tuning.

There are a number of outboard automatic antenna tuners available that are capable of tuning this type of high performance vertical antenna system.

Tuners which are built into transceivers lack sufficient impedance tuning range for this type of high performance vertical antenna system.

The actual impedance of the multi-band antenna is affected by local conditions, including proximity

to structures, other antennas, number of radials, or personal preference for the mounting location. It may be necessary to adjust the top element section slightly longer or shorter, or to vary the length of the coaxial cable, if tuning to best SWR is not achieved with your tuner on all bands.

The performance of this versatile, rugged antenna is highly dependent on the ability of your tuner to deliver a low SWR when tuned. Refer to your tuner user's manual for correct tuner operation.

Coaxial Cable and 160 Meter Notes

A 43 foot vertical antenna is a short antenna for 160, but it will get you on the air. In this instance, coaxial cable type is a very important item to consider. DX Engineering recommends a length of 150 feet of **DXE-213U** an RG-213/U to give most tuners the ability to match the antenna on the lower frequency bands where most tuning problems are encountered. One needs to examine the complex impedance (R ± j) to see the problem.

On 160 meters, the use of 150 feet of polyethylene dielectric cable (such as **DXE-213U** which has a Velocity Factor of approximately 0.66) will transform the 2 – j183 impedance at the output of the UNUN to a more tunable 38 + j180 at the tuner.

If you use 150 feet of coaxial cable that has a Velocity Factor of 0.85 (like foam dielectric LMR-400), the impedance on 160 meters would be transformed to only 3.5 + j45 – still too low an R value for many tuners. In order to achieve the recommended results, the LMR-400 length would need to be approximately 190 feet.

In general - the higher the R value, the easier it will be for the tuner to match the antenna system to your transceiver.

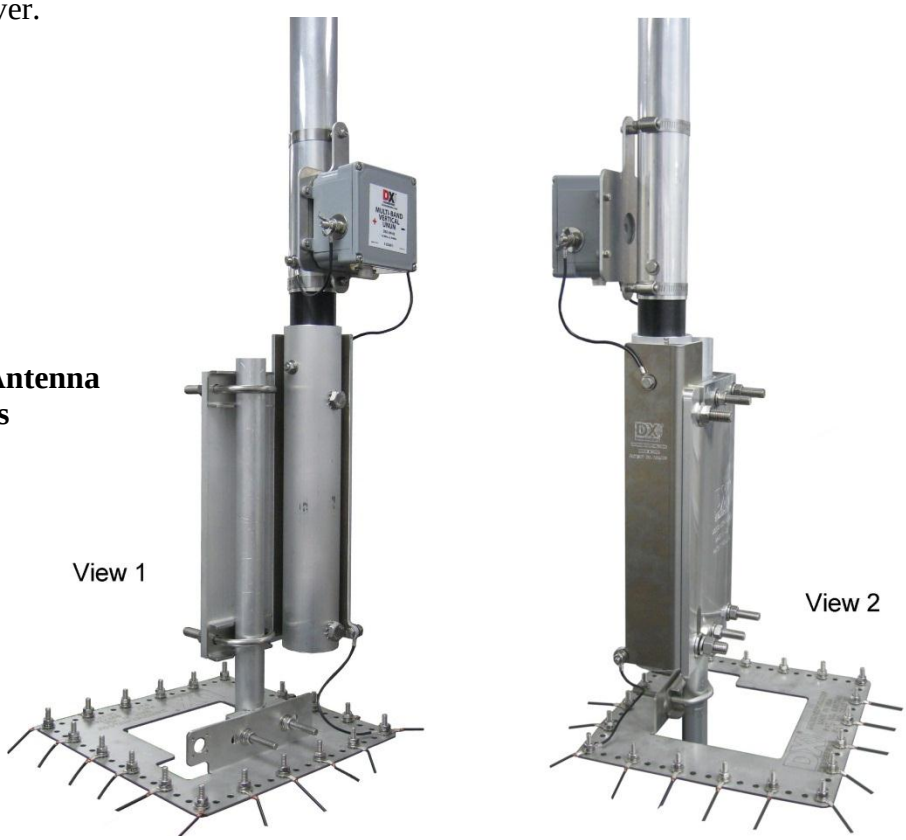


Figure 19
Completed Antenna Base Pictures

Guying a Vertical Antenna System

Guying of vertical antennas is always recommended for stability. However, if your area encounters severe wind velocities or icing conditions, simple guying will reduce the possibility of failure. Using the **DXE-GUY** kits, you can install one, two or three level guy ropes. **Figure 20** shows a two level guying system. Guying should be tightened just enough to permit the antenna to swing a few inches. The ends of the ropes are tied to the earth anchors that are screwed into the ground at about the same angle as the ropes will be. The ropes are tied just above a band clamp at the height desired. When using the Tilt Base, position the guy wires as shown below. This will make it easy to raise or lower the antenna and only one guy line needs to be loosened. The other guy lines will help guide the antenna on the way up.

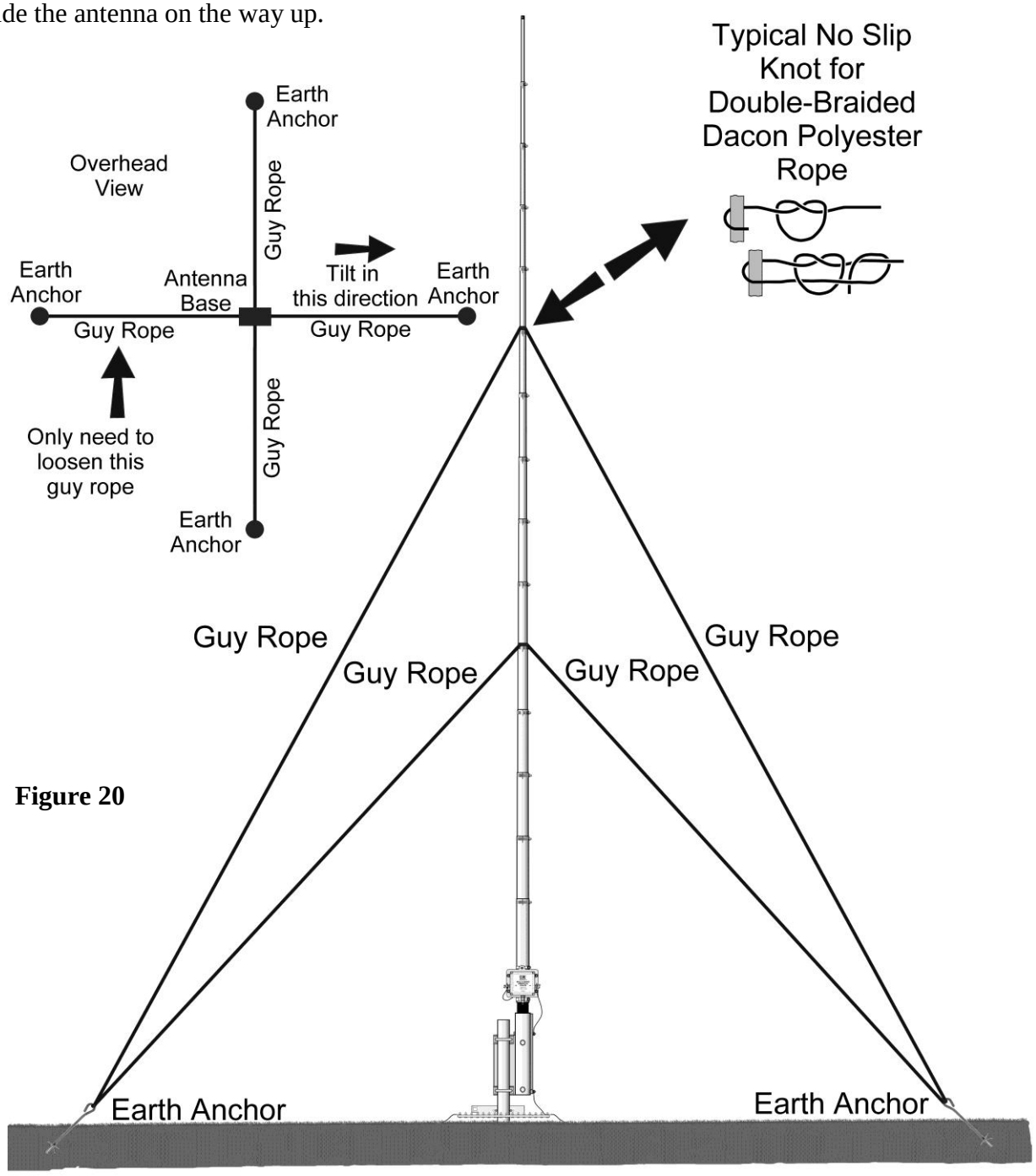


Figure 20

DXE-MBVE-5 Basic Antenna Parts List

SAF-T-Tilt™ Base Assembly (US Patent Nos. D654,063 and D654,064)	Qty	Drawing Ref. Number
Tilt Base Plate - 12” x 6” x 3/8” thick	1	1
Tilt Plate Tube - 2” OD x 10” x 3/8” thick, drilled	1	2
Tilt Base Insulator - 2” OD x 10”, drilled	1	3
Tilt Base Angle Bracket - laser cut and drilled	1	4
Stainless Steel Saddle for 3/8” V-Bolt	2	5
3/8” Stainless Steel V-Bolt	2	6
3/8” Stainless Steel Flat Washer	4	7
3/8” Stainless Steel Split Lock Washer	4	8
3/8”-16 Stainless Steel Hex Nut	4	9
3/8” Black Vinyl Tube Caps	5	10
1/2” Stainless Steel Hex Nut	1	11
1/2”-13 x 4-1/2” long Stainless Steel Hex Head Bolt	2	12
1/2” Stainless Steel Flat Washer, Thick	1	13
1/2” Stainless Steel External Tooth Washer	2	14
1/2” Stainless Steel Split Lock Washer	1	15
1/2”-13 Stainless Steel Non-Serrated Flanged Nut	1	16
1/4”-20 x 3-1/4” long Stainless Steel Hex Head Cap Screw	1	17
1/4”-20 x 3/4” long Stainless Steel Hex Head Bolt	1	18
1/4” Stainless Steel Flat Washer	2	19
1/4” Stainless Steel Split Lock Washer	3	20
1/4" Stainless Steel External Tooth Washer	3	21
1/4”-20 Stainless Steel Hex Nut	3	22
1/4”-20 x 2-3/4” long Stainless Steel Hex Head Cap Screw	1	23
7” 14 ga PVC insulated wire with two 1/4 Round Terminals	1	24
24-1/2” 14 ga PVC insulated wire with one 1/4 Round Terminals	1	For Auto Tuner option

Vertical Antenna Elements and Band Clamps	Qty
2.125" (2-1/8”) x 0.058" x 36" Tube (Slit one end, drilled)	1
2.000" (2”) x 0.058" x 36" Tube (Slit one end)	1
1.875" (1-7/8”) x 0.058" x 36" Tube (Slit one end)	1
1.750" (1-3/4”) x 0.058" x 36" Tube (Slit one end)	1
1.625" (1-5/8”) x 0.058" x 36" Tube (Slit one end)	1
1.500" (1-1/2”) x 0.058" x 36" Tube (Slit one end)	1
1.375" (1-3/8”) x 0.058" x 36" Tube (Slit one end)	1
1.250" (1-1/4”) x 0.058" x 36" Tube (Slit one end)	1
1.125" (1-1/8”) x 0.058" x 36" Tube (Slit one end)	1
1.000" (1”) x 0.058" x 36" Tube (Slit one end)	1
0.875" (7/8”) x 0.058" x 36" Tube (Slit one end)	1
0.750" (3/4”) x 0.058" x 36" Tube (Slit one end)	1
0.625" (5/8”) x 0.058" x 36" Tube (Slit one end)	1
0.500" (1/2”) x 0.058" x 36" Tube (Slit one end)	1
0.375" (3/8”) x 0.058" x 36" Tube (no slits)	1
DXE-ECL-020 - Element Clamp	1
DXE-ECL-040 - Element Clamp	1
DXE-ECL-060 - Element Clamp	2
DXE-ECL-10SS - Element Clamp	2
DXE-ECL-12SS - Element Clamp	1
DXE-ECL-16SS - Element Clamp	2
DXE-ECL-20SS - Element Clamp	2
DXE-ECL-24SS - Element Clamp	2
DXE-ECL-28SS - Element Clamp	1

Appendix 1 - DXE-MBVE-5 SAF-T-TILT™ Base Section

For reference purposes **Figure A-1** shows an exploded view of the DXE-MBVE-5 Base Section
(US Patent Nos. D654,063 and D654,064)

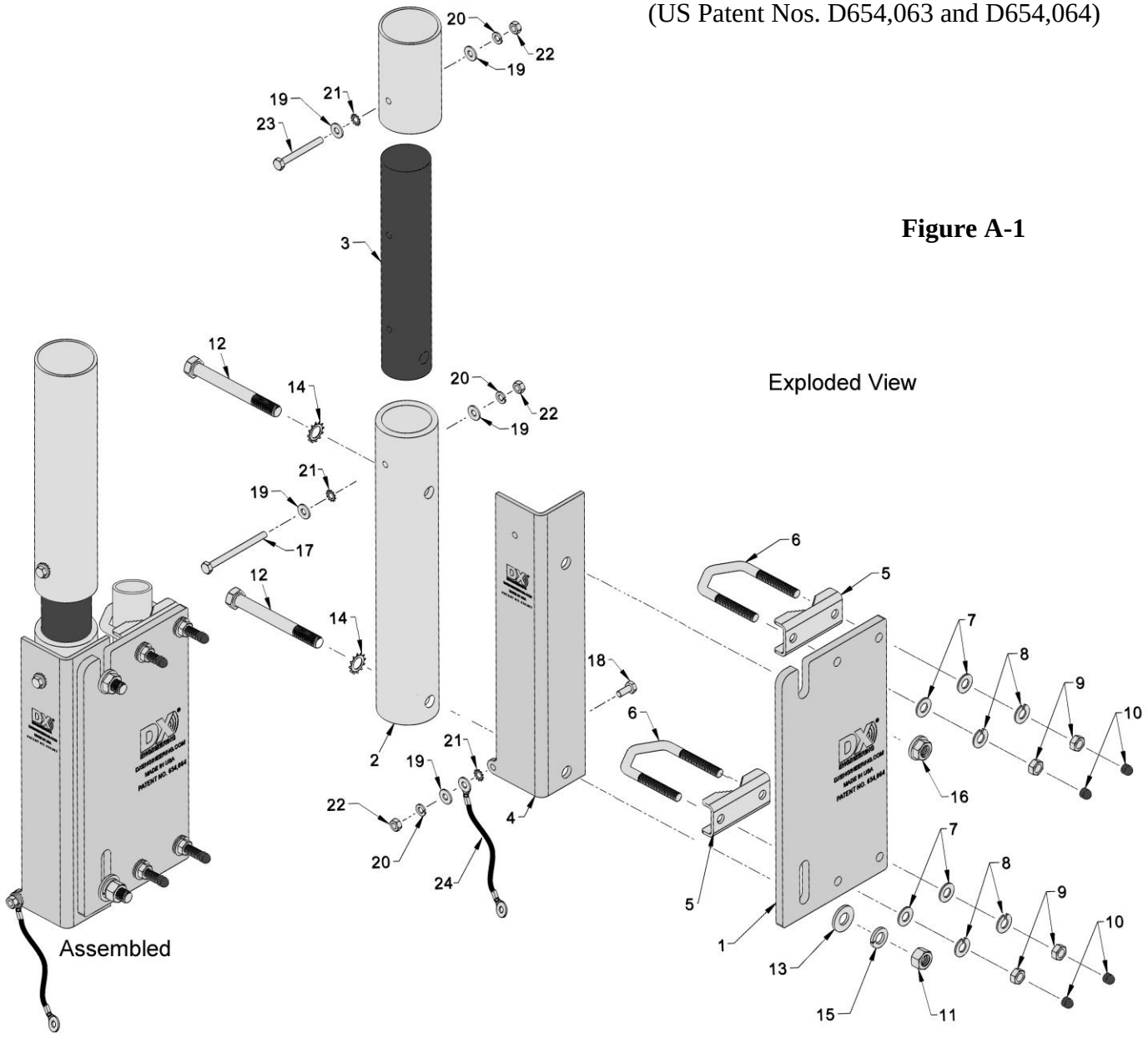


Figure A-1

#	Item Description
1	Tilt Base Plate - 12” x 6” x 3/8” thick
2	Tilt Plate Tube - 2” OD x 10” x 3/8” thick, drilled
3	Tilt Base Insulator - 2” OD x 10”, drilled
4	Tilt Base Angle Bracket - laser cut and drilled
5	Stainless Steel Saddle for 3/8” V-Bolt
6	3/8” Stainless Steel V-Bolt
7	3/8” Stainless Steel Flat Washer
8	3/8” Stainless Steel Split Lock Washer
9	3/8”-16 Stainless Steel Hex Nut
10	3/8” Black Vinyl Tube Caps
11	1/2” Stainless Steel Hex Nut
12	1/2”-13 x 4-1/2” long Stainless Steel Hex Head Bolt

#	Item Description
13	1/2” Stainless Steel Flat Washer, Thick
14	1/2” Stainless Steel External Tooth Washer
15	1/2” Stainless Steel Split Lock Washer
16	1/2”-13 Stainless Steel Non-Serrated Flanged Nut
17	1/4”-20 x 3-1/4” long Stainless Steel Hex Head Cap Screw
18	1/4”-20 x 3/4” long Stainless Steel Hex Head Bolt
19	1/4” Stainless Steel Flat Washer
20	1/4” Stainless Steel Split Lock Washer
21	1/4" Stainless Steel External Tooth Washer
22	1/4”-20 Stainless Steel Hex Nut
23	1/4”-20 x 2-3/4” long Stainless Steel Hex Head Cap Screw
24	7” 14 ga PVC insulated wire with two 1/4 Round Terminals

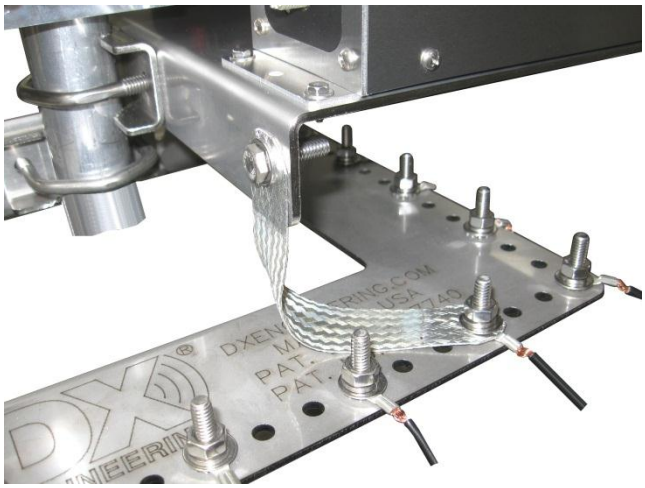
Appendix 2 - DXE-MBVE-5-3ATP - Antenna Package with the Remote Automatic Tuner

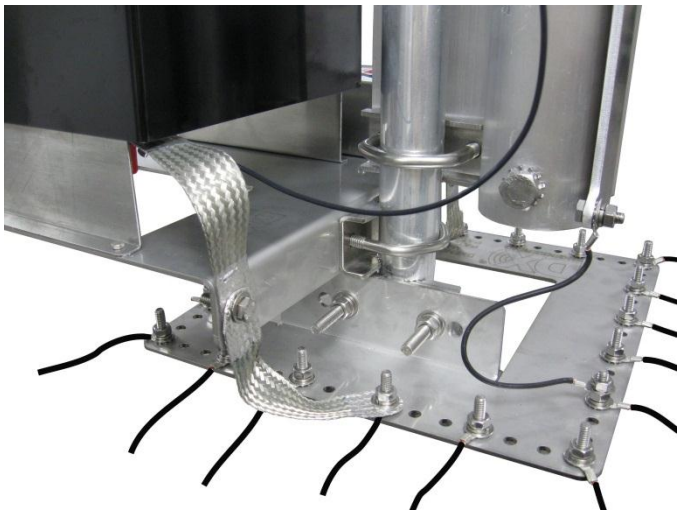
Note: The DXE-MBV-ATU-1 Remote Automatic Antenna Tuner is limited to 200 Watts maximum power.

Refer to the **DXE-MBV-ATU-1** manual for details on assembly. The only changes when using the Multi-Band Vertical Remote Antenna Tuner on the **MBVE-5** are:

1. Longer wire (with ring terminal) for the connection from the remote tuner to the **MBVE-5** feedpoint. This longer feedpoint connection (24-1/2") is included with the **MBVE-5**.

2. Positioning of the remote tuner shelf in relation to the **MBVE-5** and the **DXE-RADP-3** Radial Plate. Pictures shown below show how this is accomplished.





Optional Accessory Items

UMI-81343, DXE-NSBT8 - Anti-Seize & Never-Seez

An Anti-seize compound MUST be used on any Stainless Steel nuts, bolts, clamps or other hardware to prevent galling and thread seizure. Any of these products can be used for this purpose.

***UMI-81343**	Anti-Seize, 1 oz. Squeeze Tube
***UMI-81464**	Anti-Seize, 8.5 oz. Aerosol Can
***DXE-NSBT8**	Never-Seez, 8 oz. Brush Top
***DXE-NMBT8**	Never-Seez, 8 oz. Brush Top, Marine Grade

*** These products are limited to domestic UPS Ground shipping only**

DXE-P8A - Penetrox A Anti-Oxidant - 8 oz Squeeze Bottle

Use Penetrox A electrical joint compound to affect a substantial electrical connection between metal parts such as telescoping aluminum tubing or other antenna pieces. Ensures high conductivity at all voltage levels by displacing moisture and preventing corrosion or oxidation. For Aluminum to Aluminum, Aluminum to Copper, or bare conductors. Not recommended for use with rubber or polyethylene insulated wire.

- 8 oz. squeeze bottle

*** This product is limited to domestic UPS Ground shipping only**

DXE-RADP-3 - Radial Plate, Stainless Steel with 20 Sets of SS Radial Attachment Hardware

The patented DX Engineering Radial Plate is meant for those of you that have or are building a quarter wave vertical antenna and who want an easy, neat and effective way to connect those essential radial wires and the coax to your vertical antenna for the lowest takeoff angle and strongest signals. DX Engineering Radial Plate is laser cut from tough stainless steel so that it has smooth edges, won't corrode and will always look good. You will be proud of how good your installation looks. This plate will work perfectly with most commercially available vertical antennas such as the Hustler BTV series (4-BTV thru the 6-BTV), the SteppIR (BiggIR or SmallIR) or one of your own construction

DXE-SSVC-2P - Stainless Steel V-Clamp for steel pipe, 2 inch V-bolt

This V-Clamp is made in one size that fits Steel tubing or pipe from 1" to 2" OD as used in antenna construction. The supplied V-bolt is long enough to attach tubing to thick plates and is made with anti-corrosive properties. The special Stainless Steel saddle has serrated teeth will clamp to the pipe securely by biting into the surface. For this reason, it is not recommended for softer aluminum tubing or pipe. Ideal for fastening a radial plate and antenna mounting to a steel pipe.

- Used to clamp 1 to 2" (OD) steel tubing or pipe
- Designed for attachments that don't require resistance to torque
- V-bolt and saddle made from high-strength 18-8* stainless steel

*The use of an anti-seize compound is HIGHLY recommended to achieve proper torque and prevent galling.

DXE-GUY-Kits - Guying Kits for Vertical Antennas

Some vertical manufacturers indicate their antennas do not need guying. During times of high winds or ice loading, some of these verticals may sustain damage or fail altogether. With the small amount of effort needed to install a four point guying system, the risk hardly seems worth taking. A four-point guying scheme provides the best mechanical advantage to reduce wind stress, regardless of direction. A four point guying system is recommended for use with a DX Engineering Tilt Base, because just one of the guy ropes has to be loosened when you tilt the vertical down. The remaining guys help stabilize the vertical in three directions when being raised. The guying kits are ideal for fixed or portable installations.

DXE-GUY100-KIT	4 - Heavy Duty screw-in earth anchors with eyelets 1 - 100 ft Roll - UV resistant, 3/32 Double-Braided Dacron Polyester Rope SYN-DBR-94-100
DXE-GUY200-KIT	4 - Heavy Duty screw-in earth anchors with eyelets 2 - 100 ft Rolls - UV resistant, 3/32 Double-Braided Dacron Polyester Rope SYN-DBR-94-100
DXE-GUY400-KIT	4 - Heavy Duty screw-in earth anchors with eyelets 4 - 100 ft Rolls - UV resistant, 3/32 Double-Braided Dacron Polyester Rope SYN-DBR-94-100
DXE-GUY1000-KIT	4 - Heavy Duty screw-in earth anchors with eyelets 1 - 1000 ft Roll - UV resistant, 3/32 Double-Braided Dacron Polyester Rope SYN-DBR-94-1000

DXE-UN-43 - UNUN - 4:1, High Power, for use with Non-Resonant Verticals

DX Engineering high power transmission line transformers with Maxi-Core™ Technology allow your antenna to perform to its full potential and reduces the stresses on your equipment more efficiently than similar competitive products. This UNUN is specifically designed for application with 43-foot non-resonant multi-band antennas - assuring the best efficiency from your antenna and transmission line/tuner installation. This results in minimizing the additional transmission lines losses caused by SWR. It can be added to any existing 43-foot antenna installation, or used to replace an older competitive UNUN for a performance increase.

- 1.8 – 30 MHz operating range to cover popular amateur bands.
- Handles rated power with minimal energy loss so there is no thermal related failure.
- Ratio - 4:1
- Impedance: 200 ohms to 50 ohms - optimized for 43 ft verticals
- Power Level – 2 KW / 5 KW PEP
- Frequency Range – 1.8 to 30 MHz
- Weatherproof NEMA enclosure
- Silver / Teflon SO-239 input connector
- 2-3/8" x 4" x 4" inches (HxWxL)

DXE-UN-BRKT - UNUN Mounting Kit for Multi-Band HF Verticals (patented)

This mounting kit allows you to mount a DXE-UN-43 UNUN at the base of any 43-foot Multi-Band vertical antenna. The aluminum mounting plate may be clamped to any 2" OD aluminum tubing element with the studded element clamps supplied. The UNUN is isolated by its plastic weather proof case, providing the simplest add-on installation. Works with the DXE-UN-43 UNUN, or similar competitive UNUNs and Baluns which use the same weatherproof NEMA case.

Kit includes:

- Aluminum Mounting Plate
- Studded Stainless Steel Element Clamps
- Stainless steel mounting hardware

DXE-MBV-ATU-1 - Multiband 43 ft Vertical Antenna Tuner Add-on Kit

The DXE-MBV-ATU-1 is the perfect solution for the modest power (200 watts maximum) DXer who wants maximum performance on a 43 foot tall multi-band vertical antenna! Now you can hear and work the weak ones! Just install on your antenna mount and start operating. **NO MANUAL TUNING!** Now you can have full performance 80-10 meters with no coaxial cable mismatch loss! A no compromise system! A Bias Tee is included with this special package for supplying the 12 Vdc power through the coaxial cable from your radio shack to the remote tuner. **Works on all DX Engineering, Zero-Five, MFJ and Hy-Gain 43 foot vertical antennas. Also on your own vertical antenna homebrew creation! Shown here in a typical installation with optional radial plate and tilt base:**

DXE-MBV-ATU-1 Features:

• MFJ-927 Remote IntelliTuner™ - 200 Watts
• DXE-FCC050-H05-A Feedline Current Choke
• DXE-SSVC-2P Stainless Steel Mounting V-Clamp
• Custom Laser Cut Stainless Steel Bracket for Tuner and FCC
• Bias Tee Power Injector for 12 Vdc
• RG-8X 2 ft Coaxial Cable with PL-259 Connectors
• 2 Tinned Copper Braids, 1" wide for connection to your optional Radial Plate
• Feedline wire - 14 ga insulated stranded copper with Ring Terminal attached.

DXE-RADW - 500K or 1000K Radial Wire Kits and Components

To achieve optimal performance with a ground-mounted vertical, install as many radials as possible. These bulk radial wire kits use insulated wire that is UV resistant, hard to see and lays down easily, unlike the wire that is commonly available at the big box stores. It will last much longer in contact with soil than bare wire.

The DXE-RADW- 500K or 1000K kit provide everything you will need to build the perfect radial system!

- 500/1000 ft. spool of 14 AWG, stranded copper wire with vinyl insulation
- 20/40 lugs
- 100/200 radial wire anchor pins - Eliminating the need to bury your radials!
- Build up to 20/40 radials, 25 feet long

DXE-RADW-500K	Bulk Radial Wire Kit, 500 ft Spool of Wire, 20 Lugs, 100 Staples
DXE-RADW-1000K	Bulk Radial Wire Kit, 1000 ft Spool of Wire, 40 Lugs, 200 Staples

DXE-RADW-500KBD or 1000KBD - Bulk Radial Wire Kits and Components

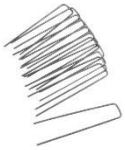
To achieve optimal performance with a ground-mounted vertical, install as many radials as possible. These bulk radial wire kit use insulated wire that is UV resistant, hard to see and lays down easily, unlike the wire that is commonly available at the big box stores. It will last much longer in contact with soil than bare wire. The biodegradable anchors allow easy installation of radial wires, and will degrade and disappear in a year or so when they are no longer needed. The DXE-RADW-500 or 1000KBD kits provide everything you will need to build the perfect radial system!

- 500/1000 ft. spool of 14 AWG, stranded copper wire with vinyl insulation
- 20/40 lugs
- 100/200 biodegradable radial wire anchor pins- Eliminating the need to bury your radials!
- Build up to 20/40 radials, 25 feet long

DXE-RADW-500KBD	Bulk Radial Wire Kit, 500 ft Spool of Wire, 20 Lugs, 100 Biodegradable Staples
DXE-RADW-1000KBD	Bulk Radial Wire Kit, 1000 ft Spool of Wire, 40 Lugs, 200 Biodegradable Staples

DXE-STPL - Radial Wire Anchor Pins, 100/pack - No need to bury your radials!

DX Engineering Radial Wire Anchor Pins are perfect for fastening radials below the grass line to eliminate the risk of damaging your radials during lawn maintenance.



- 100 count - 6" Pins
- 11-Gauge

DXE-STPL-100P	Radial Wire Anchor Pins, 100/pack
DXE-STPL-300P	Radial Wire Anchor Pins, 300/pack

DXE-STPL-100BD - Radial Wire Staple, Biodegradable, 3", 100 pack

DX Engineering DXE-STPL-100BD is a 100-pack of 3" **biodegradable** anchors that are produced from recycled PLA (Polylactide Resin). Depending on the weather conditions, they will degrade in about a year. They are easily installed and will hold radial wires in place until lawn roots overtake them - and then disappear. Ecologically friendly!

DXE-225RT-20 - Ring terminal 16-14 Wire Gauge, 1/4" hole/20-pk

\his is a set of 20 ring terminals for AWG #14 to #16 wire with a clearance hole for a 1/4" bolt. These are the same crimp terminals supplied with the DXE Radial Wire Kits for #14 Radial and Antenna Wire.

SUM-900031 - Automatic Wire Stripper/Crimper/Cutter, 24-10 Ga.

Our wire stripper uses a spring-loaded design to make quick work of wires ranging from 24 to 10 gauge. Just insert the wire, squeeze the handle, and listen for the click. That's the sound of another perfect wire stripping job performed in about 2 seconds- a fraction of the time it takes your pocket knife to do the same job. An adjustable wire length guide helps you make uniform strips, and a built-in wire cutter and crimper helps you complete your wiring job.

- Spring-loaded design
- Strips wires ranging from 24 to 10 gauge
- built-in wire cutter and crimper

DXE-3M2155 - 3M Temflex™ 2155 Rubber Splicing Tape.
Conformable self-fusing rubber electrical insulating tape. It is designed for low voltage electrical insulating and moisture sealing applications. For outdoor use, it should be protected from UV deterioration with an overwrap of **TRM-06133**

TRM-06133 - Scotch® Super 33+.
Highly conformable super stretchy tape for all weather applications. This tape provides flexibility and easy handling for all around performance. It also combines PVC backing with excellent electrical insulating properties to provide primary electrical insulation for splices up to 600V and protective jacketing.

DXE-RADW-20RT/-32RT/-65RT Pre-Assembled, Radial Wire, w/ 1/4" ring Terminals, 20 Pack
The DXE-RADW Radial Wire Kits include the highest quality 14 gauge stranded copper wire with a relaxed black PVC insulation for easy installation of your radial system. The twenty pre-cut radial wires include 1/4" ring terminals professionally crimped on one end for quick and easy attachment to the radial plate. These Radial Wire Kits are designed for users of vertical antenna systems which have the need for a high quality radial system for optimum antenna performance. The 1/4" ring terminals are machine crimped for maximum grip. Soldering is not required for strength, but is recommended if installed in corrosive environments such as salt spray.

- Packed 20 Radial Wires per package - 14 gage, stranded copper wire - Black relaxed PVC insulation
- 1/4" Ring Terminal professionally crimped on each Radial Wire
- 3 lengths to choose from: 20 Ft (-20RT), 32 Ft (-32RT), 65 Ft (-65RT)

DXE-RADW-20RT	Package of 20 each 20 Ft Radials with 1/4" Ring Terminals
DXE-RADW-32RT	Package of 20 each 32 Ft Radials with 1/4" Ring Terminals
DXE-RADW-65RT	Package of 20 each 65 Ft Radials with 1/4" Ring Terminals

Technical Support

If you have questions about this product, or if you experience difficulties during the installation, contact DX Engineering at (330) 572-3200. You can also e-mail us at:

DXEngineering@DXEngineering.com

For best service, please take a few minutes to review this manual before you call.

Warranty

All products manufactured by DX Engineering are warranted to be free from defects in material and workmanship for a period of one (1) year from date of shipment. DX Engineering's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by DX Engineering. If DX Engineering's products are claimed to be defective in material or workmanship, DX Engineering shall, upon prompt notice thereof, issue shipping instructions for return to DX Engineering (transportation-charges prepaid by Buyer). Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing. The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation, damaged from severe weather including floods, or abnormal environmental conditions such as prolonged exposure to corrosives or power surges, or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's specifications. In addition, DX Engineering's warranties do not extend to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to DX Engineering. The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR DX ENGINEERING ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

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